DOCUMENT RESUME

ED 327 376 SE 051 820

AUTHOR	Sivertsen, Mary Lewis, Comp.
TITLE	Science Education Programs That Work. A Collection of Proven Exemplary Educational Programs and Practices in the National Diffusion Network.
INSTITUTION	Office of Educational Research and Improvement (ED), Washington, DC. Programs for the Improvement of Practice.
REPORT NO	PIP-90-846
PUB DATE	Oct 90
NOTE	31p.; For previous editions see ED 283 673 and ED 316 434. Product of the Recognition Division.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.
PUB TYPE	Reference Materials - Directories/Catalogs (132)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Course Descriptions; Curriculum Guides; *Elementary School Science; Elementary Secondary Education; *Instructional Materials; Learning Modules; National Programs; *Program Descriptions; *Science Curriculum; Science Education; Science Instruction; *Secondary School Science; Teaching Methods; Zoos
IDENTIFIERS	*National Diffusion Network

ABSTRACT

These programs are available to school systems or other educational institutions for implementation in the classroom. Some programs may be able to offer consultant services and limited assistance with the training and materials associated with installing one of these programs in schools. Information about the National Diffusion Network (NDN) is provided. Programs listed include: (1) "Conservation for Children"; (2) "Foundational Approaches to Science Teaching (FAST)"; (3) "Geology Is"; (4) "Hands-On Elementary Science"; (5) "Informal Science Study (ISS)"; (6) "Life Lab Science Program"; (7) "Marine Science Project: FOR SEA"; (8) "The Mechanical Universe High School Adaptation"; (9) "Physics Resources and Instructional Strategies for Motivating Students (PRISMS)"; (10) "Physics-Teach to Learn Program"; (11) "Sci-Math"; (12) "Starwalk"; (13) "Stones and Bones: A Laboratory Approach to the Study of Biology, Modern Science, and Anthropology"; (14) "Wildlife Inquiry Through Zoo Education (WIZE)"; (15) "Jeffco Life Science Program"; and (16) "Science-Technology-Society: Preparing for Tomorrow's World." A listing of state facilitators and a facilitator for private schools is also included. (KR)

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Science Education Programs That Work

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A Collection of
Proven Exemplary Educational Programs
and Practices
in the National Diffusion Network

SE 051 820

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Science Education Programs That Work

A Collection of Proven Exemplary Educational Programs and Practices in the National Diffusion Network

Compiled by
Mary Lewis Sivertsen

Recognition Division, Programs for the Improvement of Practice

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October 1990

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

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Introduction

This catalog contains descriptions of the science education programs in the National Diffusion Network. These programs are available to school systems or other educational institutions for implementation in their classrooms. While all of the programs have been validated as effective by the Department of Education's Program Effectiveness Panel (formerly the Joint Dissemination Review Panel), some no longer have current validation. Those marked with an asterisk in the Table of Contents are currently receiving funds for dissemination from the National Diffusion Network. The funded programs may be able to offer to interested schools consultant services and limited assistance with the training and materials associated with installing one of these programs in their classrooms. Unfunded Panel-approved programs are able to offer services through cost/service agreements negotiated with potential adopters.

For further information on the National Diffusion Network or on these programs in science education, please contact your State Facilitator or Private School Facilitator (see listing, pages 19-24) or the National Diffusion Network Program, Office of Educational Research and Improvement, U.S. Department of Education, 555 New Jersey Avenue, NW, Washington, DC 20208–5645, or by telephone at (202) 357–6134, or, after October 29, 1990, (202) 219-2134.

national diffusion network

SO . . .
You Want To Know More About the NDN

What is the National Diffusion Network?

The National Diffusion Network (NDN) is a federally funded system that makes exemplary educational programs available for adoption by schools, colleges, and other institutions.

It does so by providing dissemination funds to exemplary programs, called Developer Demonstrator projects or Dissemination Process projects, for two purposes: (1) to make public and nonpublic schools, colleges, and other institutions aware of what they offer, and (2) to provide training, materials, and followup assistance to schools and others that want to adopt them.

NDN also provides funds to State Facilitators, whose job it is to serve as matchmakers between NDN programs and schools and organizations that could benefit from adopting the programs.

What makes the NDN Developer Demonstrator projects different from commercial products?

Several important things. NDN Developer Demonstrator project staff do not just hand a program to a school and expect the school to figure out how to use it. Instead, NDN program directors help local schools implement their programs to suit each school's unique needs. To do that, the director of the program provides training, lasting from one day to a week or more, to staff members in the adopting school. The director also provides followup assistance in the form of additional training, visits, telephone consultation and newsletters. Sometimes, a program director or a State Facilitator arranges for all adopters of a particular program in a region or state to form a network so they can share successful approaches and solve common problems. All NDN services are provided at little or no cost to adopters.

How does NDN assure that a program is effective and worthy of replication in other schools?

Before a program can become eligible for funding as a part of the NDN, it must be approved by the Department of Education's Program Effectiveness Panel. A program requesting a review must provide evaluation data that prove that the program is effective in the school in which it was developed or field tested, and that it could be used successfully in other schools. As of October 1990, approximately 500 programs had been approved and 88 of them were receiving Federal dissemination funds to help other schools adopt them.

What kinds of programs are available for adoption through the NDN?

NDN programs can meet the needs of students of every age—preschool through adult—and the needs of teachers, administrators and other school personnel. Subject areas represented among the NDN programs include mathematics, science, and reading. There are also programs in writing, technology, the humanities, and programs for gifted and talented students.

Some programs are designed to improve preservice and inservice teacher training. Other fields represented include special education, career and vocational education, adult literacy, early childhood education, health, and physical education. Some programs are directed toward processes to improve school administration and management and thereby improve instruction.

Is it possible to see a Developer Demonstrator program in action?

Yes. Each Developer Demonstrator program receiving federal dissemination funds maintains a demonstration classroom or school where visitors are welcome. These programs are located across

the United States. In addition, many of the programs have demonstration sites in states other than the one in which they were developed. NDN State Facilitators can arrange for visits to a demonstration school, or to an adoption site.

How does a school adopt an NDN program?

The first step is to contact one of the NDN State Facilitators. Their job is to help schools and other organizations learn about and adopt NDN programs. Often, for example, they hold "awareness conferences" featuring one or more NDN programs and invite educators to attend. They also work with educators in identifying the needs in a particular school and in determining which NDN program offers a solution. When a school decides to adopt an NDN program, the facilitator arranges for the program's developer to provide training to staff in the adopting school. In addition, if a school requires financial assistance to make an adoption, the Facilitator usually knows about funding sources and how to apply for a grant under various Federal, State, or local programs or from private foundations or industry. Some facilitators sponsor meetings for administrators on how to apply for financial assistance.

What if the program a school wants to adopt is located in another state?

That's no problem; the NDN was developed so that educators would have access to exemplary programs, whether these programs are located in the same state or not. NDN brings the program to the school or district that wants it.

How much does it cost to adopt an NDN program?

The cost varies. NDN's aim is to provide adoption assistance at minimal cost. State Facilitators are supported by NDN grants, so there is no cost for their services, and there is little or no cost for training. An adopter usually pays for any required curriculum materials and for release time for teachers to attend training. Some schools help meet adoption costs with a grant from local or state funding sources or with funds from other sources including the private sector.

What is the responsibility of a school in making an adoption?

Each Developer Demonstrator program has basic requirements to be met by adopters. Adopting schools, for example, are usually required to implement certain basic features of the program, such as regular monitoring of students' academic progress or the use of certain activities. Some programs may require the adopting schools to compile pretest and posttest scores or other appropriate measures of effectiveness and growth in order that the adopted program's benefits can be accurately evaluated. Each adopter agrees to an adoption plan which outlines roles and responsibilities of the parties concerned.

Can NDN really help schools?

Many teachers, administrators, and other educators think so. In 1988-89 alone, NDN programs were installed in approximately 30,000 schools. An estimated 83,000 teachers and other school personnel received training in the use of NDN programs and approximately 4,150,000 students were served by these adoptions. Several evaluations of the NDN show that it is meeting its goal of helping schools improve education through the dissemination of effective programs.

Where can you get more information about NDN programs?

Contact your NDN State Facilitator, Private School Facilitator, or U.S. Department of Education, Recognition Division, 555 New Jersey Avenue NW, Washington, DC 20208-5645, phone (202) 357-6134, or, after October 29, 1990, (202) 219-2134.

A catalog describing all of the programs in the National Diffusion Network in greater detail is available for $10.95 plus $2.00 for shipping from Sopris West, Inc., 1140 Boston Avenue, Longmont, Colorado 80501, (303) 651-2829.

Conservation for Children. A practical, economical program to increase conservation awareness, understanding, and action of elementary school children through a variety of basic skill activities designed for use in the classroom.

Audience Approved by JDRP for children in grades 1-6.

Description Through a variety of basic skill activities intended for use in the classroom, Conservation for Children teaches about the interdependence of plants and animals, requirements of life, energy sources and use, pollution problems, recycling, and other conservation concepts based on scientific principles. The grade level conservation guides provide instructional materials which combine basic skill practice in the areas of language arts, math, social studies and science with a conservation concept. Program materials are used to supplement or replace presently used skill materials, so that no additional preparation time or equipment is needed. Teachers can use the materials as a primary resource for teaching basic skills, as supplementary materials to a core program, as enrichment activities, skill review, or as independent units of study. No change in staffing, physical setting, equipment, or instructional methodology is required. Criterion-referenced tests allow teachers to determine which materials are appropriate for individual students or groups. Special education teachers have found the materials valuable for use with their students due to the high interest level of the worksheets and the choice of ability levels and basic skill concepts.

Evaluation data confirms that students using the materials for a minimum of 30 minutes per week master 80% of the learning objectives. In addition, 75% of the parents of 2,000 students in the evaluation study responded in writing that they had observed their children implementing conservation practices at home which they had never seen before the children used the program materials.

Conservation For Children materials include six grade level curriculum guides (1-6) and one alL Levels guide (activities, resources). After the initial purchase of the guides, $25 per grade level, $165 for the complete program, there are no on-going costs for personnel, materials, or inservice training. A per pupil cost for installation is only $.70. There are no recurring costs.

Requirements The program may be used in any type of facility or setting and does not rely on any particular methodology or teaching style. The program is designed for use in the classroom and does not require any materials or equipment that are not normally found in any school. The curriculum guides may be reproduced in whole or in part with the permission and hope of the authors. Inservice as to implementation and material usage is minimal, usually two hours. The program requires no staffing changes as the classroom teacher continues to provide instruction.

Services Awareness materials are available at no cost. Visitors are welcome at the project site any time by appointment. Project staff is available to attend out-of-state awareness meetings (costs for travel expenses to be negotiated).

Contact **Marilyn Bodourian, Project Director; Conservation for Children; or Stephanie Hendee, National Training Network, P.O. Box 1809, Longmont, CO 80502-1809 (303) 651-0833.**

Developmental Funding: ESEA Title IV-C

JDRP No. 83-12 (3/4/83)

Foundational Approaches in Science Teaching. A course in the concepts and methods of the physical, biological and earth sciences and their relation to the environment.

Audience Approved by JDRP for students in grade 7. This program has also been used with students in grades 6 and 8.

Description This curriculum is a full year course giving students a sense of the operations of the modern scientific community by involving them in typical science activities. FAST is laboratory and field-oriented and designed for use with students who represent the full range of abilities and interests found in the typical middle/junior high school classroom. Instructional strategies are structurally sequenced to address differences in learning styles and to develop thinking skills. Students study three strands concurrently: physical science, ecology and relational study.

The physical science strand introduces such concepts as mass, volume, density, buoyancy, physical and chemical properties of matter, pressure, vacuum, heat, temperature and energy; the ecology strand such concepts as ecology, plant and animal growth and development, weather and climate, field mapping and population sampling; the relational study strand such concepts as resource management, technology, environmental use, energy use and conservation.

Student and teacher materials guide student investigations. The Student Record Book enables students to record a concise log of individual and class activities. A classroom library of Reference Booklets, which describe use of instruments, suggest experimental designs, outline experimental techniques, and provide necessary supplemental readings, helps students to practice the skill of using outside references to supplement information available from the investigations and Student Book. The Teacher Guide presents the logic connecting topics and sequences. Keyed to the investigations in the Student Book, the Teacher's Guide includes teaching suggestions, advice on classroom procedures, and detailed discussion of the conceptual and practical development of the students' investigations. Other materials for teachers include the Instructional Guide and Evaluation Guide.

Requirements Adopting teachers are required to take 10 days of training (provided free with sufficient book purchases). Adopting schools are assumed to have basic science equipment and supplies including 6-10 centigram balances. An equipment kit is required. Recommended: a local project coordinator to monitor implementation activities, conduct bimonthly meetings with adopting teachers, and provide help to teachers as needed. Additional training is available for local coordinators and teacher trainers.

Services Awareness materials are available at no cost. Examination copies of student and teacher materials are available at cost, videotape describing the program available on loan (specify Beta or VHS). Visitors are welcome at project site and at selected demonstration sites by appointment. Some demonstration sites are available in other states. Project staff and/or certified representatives are available to attend awareness meetings on negotiated cost basis. Teacher training is conducted each summer at project site or can be provided for adoptors at adoptor site.

Contact **Donald B. Young, Co-Director; Curriculum Research and Development Group; University of Hawaii; 1776 University Ave., Rm UHS 2-202; Honolulu, HI 96822 (808) 948-7863.**

Developmental Funding: University of Hawaii

JDRP No. 80-2 (12/9/80)
Recertified (1/85)

10

Geology Is. An introductory geoscience course.

Audience Approved by JDRP for all students, grades 9-12.

Description Designed to become part of the secondary school curriculum, *Geology Is* provides geoscience learning opportunities not presently available in the science curriculum. A broad range of materials and media-delivery instruments allow for varied teaching and learning techniques. The technical aspects of course content and the social implications in the wise use of earth resources combine in an effective interdisiplinary approach. Awareness and understanding of geoscience processes make students more responsible consumers of earth materials and protectors of the environment.

The five distinct but related units of *Geology Is* are Introduction, Earth Materials, Observing the Earth, Internal Processes, and External Processes. These are subdivided into a total of 20 chapters. Although it is a two-semester course, parts can be taught as a semester offering. Each unit contains text material, lab exercises and activities, and objective and subjective tests. Slide-tapes, films, videotapes, and guest speaker presentations are offered, and students are encouraged to evaluate these. Small groups and individuals investigate topical areas for student-led class discussions. Off- and on-campus field experiences and resource personnel add another dimension to the text. Teachers are provided with a guide and an activities handbook as a supplement to the student textbook.

Through study in this elective option, students can become more responsible consumers of earth resources and make informed decisions for the future regarding energy, geologic hazards, and land use.

Requirements The adopting district will need to provide an instructor with some basic coursework in the geosciences. Other than that, a typical science classroom and supplies are the only other requirements for adoption.

Costs The major cost to the district will be for the purchase of the *Geology Is* textbook and activity sheets. In addition, some supplies for the activities may have to be purchased if the district does not have an existing geoscience class.

Services Awareness materials are available at no cost. A VCR tape presentation is available. Visitors are welcome at project site anytime by appointment. Project staff is available to attend out-of-state awareness conferences (cost to be negotiated). Training is conducted either at the project site or at the adopter site (costs to be negotiated). Implementation and follow-up services are available to adopters (costs to be negotiated).

Contact **Rion D. Turley; O'Fallon Township High School; 600 South Smiley; O'Fallon, IL 62269. (618) 632-3507.**

Developmental Funding: USOE ESEA Title IV-C

JDRP No. 81-42 (12/18/81)
Recertified (2-86)

Hands-On Elementary Science. An instructional program intended to provide elementary students with hands-on instruction emphasizing the processes of science.

Audience Approved by JDRP for elementary teachers and students, grades 1-5.

Description The *Hands-On Elementary Science* provides elementary students with instruction that emphasizes the development of science processes as an approach to problem solving. In fostering positive teacher attitudes toward teaching science, it increased both the amount of science taught and the proportion of instruction dedicated to the processes of science. The curriculum employs a set of higher order processes at each grade level consisting of four basic units. The units consist of lessons concerning a unifying topic. The topic is based upon the skills identified for that grade level. First grade students work primarily on observation in the four units of seeds, patterns and magnets and liquids. Second grade emphasizes classification skills through the study of insects, sink or float, measurement, and life cycles. In the third grade, experimentation skills are developed by units on flight, measuring, plants and structures. Fourth grade focuses on analysis in units on bio-communities, electricity and chemistry and energy transfer. The fifth grade curriculum emphasizes application and consists of units on earth science, soil analysis, animals, and ecosystems. Since this is not a text program, all lessons are based upon hands-on activities supported and defined by curriculum guides at each grade level. They provide a sequence of basic lessons and incorporate all necessary materials to support the program lessons. A unique feature of the program is an optional package of materials students may request to work on over the summer.

Requirements *The Hands-On Elementary Science* program is transportable to other sites where a commitment exists for hands-on science instruction. Adoption of this program requires at least a half year planning and preparation followed by a staff development program. Teacher preparation consists of two days training prior to the implementation of the program followed a follow-up workshops to resolve problems of implementation. Materials required include both a curriculum guide and a kit of materials of the appropriate grade level for each teacher and copies of the voluntary summer program for dissemination to interested students.

Costs The cost of the program in the installation year is approximately $27 per student (assuming 25 students per class in a school of 800 students and training 20 teachers at a grade level). Subsequent year costs to maintain the program through the replacement of consumable supplies equals $1.50 per student. Teacher guides are available for $15 each plus postage and handling and kits are available from a national vendor at costs ranging from $345 to $565 depending upon the grade level.

Services Awareness materials are available at no cost. Visitors are welcome by appointment at project site and additional sites in home state. Project staff is available to attend out-of-state awareness meetings (costs to be negotiated). Training is available at project site and also at adopter site (costs to be negotiated). Implementation and follow-up services are available to adopters (costs to be negotiated).

Contact **Dean A. Wood; Dissemination Center For Hands-On Elementary Science; Hood College, Frederick, MD 21701 (301) 663-3131, ext. 205 & 350.**

Developmental Funding: Federal, State and Local

JDRP No. 86-19 (9/23/86)

Informal Science Study (IfSS)

Audience Approved by JDRP for all students in grades 5-12.

Description To promote concept acquisition IfSS presents a series of physical science mini-units which are based upon students' recall and utilization of popular amusement park rides, sports, and playground experiences. Experiences are selected for their student appeal and their ability to provide concrete examples of otherwise abstract concepts. Topics covered include among others, motion, acceleration, relativity, forces, gravity, time, graphing, conservation of energy, and frames of reference.

Each of the mini-units is designed around student dialogue, providing an introduction and review/application of physical science and mathematics in low-key, predominantly non-technical, language. Physical science terms are introduced only after instruction as needed. In addition, several of the units provide laboratory experiences using toys (race cars, model rockets etc.) and playground equipment.

Mini-units include:

- *Physics of Fun and Play* is designed for any of grades 5-12. The focus of the module is the physics of amusement parks and sports. Question/answer student guides are designed to elicit student recall of past amusement park experiences and are coupled with color slides of rides to assist the teacher in focusing on appropriate content. A secondary element focuses on sports and playground activities.
- *The Informal Science Safari and Toy Workshop* is designed for grades 5-9 and presents mechanics content and terms as well as pre-algebra mathematics exercises that call for numerical manipulations of physics concepts. The talking-book approach utilizes a talking wizard (the Wizard of If) who introduces learners to the science content in their own words. A separate section of this module provides related laboratory activities utilizing common toys. Teacher materials include a video-tape that focuses on how selected toys work in zero-gravity environments such as the NASA space shuttle.
- *Spaceflight Forces and Fears.* This two-part module deals with the application of mechanics concepts and amusement park rides as they relate to the experiences of orbiting astronauts. Students (preferably grades 7-10) also explore physiological responses to fearful situations. Optional computer simulations are available to explore physiologic reactions to rides in simulated settings.
- *Mechanics of Motion.* Designed for the introductory high school class, this is the most complex and detailed of the modules. Algebraic and pre-calculus mathematics are required for students who deal with the design and operation of amusement park rides from the viewport of the design engineer. Additional computer simulation activities are available for classroom use.
- *The Discovery Field Experience.* This module focuses student attention on experiences within amusement parks and in athletic events. Generic ride experiences as well as specifically designed guides for representative amusement parks are included for classroom, playground, and amusement park settings. Part of the module provides student worksheet activities for major and minor sporting events. This module can be adapted for any grade level, 5-12.

With instructional periods from 1-3 weeks, students significantly increase knowledge and comprehension of science concepts, analytic recall of science experiences, and demonstrate significantly increased applications of science concepts to unique situations.

Requirements Mini-units may be adopted individually or as a group. Teachers may be trained in four hours.

Services Awareness materials are available at no cost. Visitors are welcome to visit the project site by appointment. Project staff is available for awareness. Costs which include training, materials, and equipment are negotiable.

Contact **Howard Jones, Project Director, or Stephanie Hendee, National Training Network, P.O. Box 1809, Longmont, CO 80502-1809. (303) 651-0833.**

Developmental Funding: National Science Foundation

JDRP No. 84-11 (3/30/84)

Jeffco Life Science Program. A middle school program which enables students to understand the human body, basic ecological principles, and issues associated with environmental problems; and to make decisions to improve health-related behaviors.

Audience Approved by PEP for students in seventh and eighth grades of all abilities who are involved in a year-long science program.

Description This program is a year-long life science course which replaces the curriculum currently being used in general science or life science. It can also be used in an integrated science-health course.

Learner materials consist of a text that integrates laboratory activities and readings. Topics fall into seven categories: body structure, foods and digestion, body basics, body changes, cells and genetics, body controls, and ecosystems and ecology. These categories were defined by life science teachers based upon their experiences with students as well as on the recommendations of nationally recognized experts in middle school science curriculum. Content is delivered in a learning cycle that consists of three phases: exploration, concept formation, and application. In the exploration stage, students carry out an experiment or investigation. This activity introduces them to the phenomena and experiences that lead to concept development. Finally, students apply the concept in an application activity or discussion. Development of thinking skills is emphasized throughout the program.

A comprehensive teacher's guide includes instructional procedures for effectively presenting activities, detailed answer keys, supportive background information, worksheet masters, overhead transparencies, optional student activities, and evaluation test items.

Evidence of Effectiveness In terms of student acquisition of conceptual and factual knowledge, students in the life science course scored significantly higher on reliable locally developed tests. Higher performance of the treatment group was generalizable across ability levels, gender, and teachers.

Requirements A typical middle school science classroom/laboratory is required, including flat top tables, storage space, and at least one sink. In addition to basic science equipment and supplies (including light microscopes) some unique materials are required. An inservice program of approximately 40 hours is strongly recommended.

Costs For appropriately equipped schools, it costs approximately $800 to set-up a classroom with the necessary unique equipment and non-consumable materials. Student textbooks cost $24 each. The annual cost of consumables averages $1.10 per student.

Services In addition to the materials and staff development activities previously mentioned, a series of multiple choice tests for assessing student progress is available. Awareness materials can be obtained at no cost.

Contact **Harold Pratt, Jefferson County Public Schools, 1829 Denver West Drive, Building 27, Golden, Colorado 80401, (303) 273-6559.**

Developmental Funding: Local funding and National Science Foundation PEP Approval No. 90-04 (2/6/90)

Life Lab Science Program. An applied science program emphasizing a hands-on, garden-based "living laboratory" approach to elementary science education.

Audience Approved by JDRP for elementary students, grades 2-6.

Description The *Life Lab Science* program strives to ensure students' future interests and success in science by improving student attitudes toward the study of science, and increasing students' level of knowledge and skill acquisition in science. The instructional approach is a combination of indoor and outdoor hands-on science activities with the key component being the garden lab (e.g. indoor grow box, greenhouse, planter boxes, vegetable beds, etc.). Students and teachers collaborate to transform their school grounds and/or classrooms into thriving garden laboratories for the application of scientific processes. In this setting students conduct experiments using the scientific method. They observe, collect and analyze data, establish worm colonies, raise vegetables, herbs and flowers, and have responsibility for maintaining their living laboratory. A structured course of study is followed in science, nutrition and gardening. Instructional time varies from two to four hours per week. Teachers are responsible for all classroom instruction and use The Growing Classroom curriculum guide for the bulk of their science lessons.

Requirements The critical learner setting is the "living laboratory" whether an indoor grow box, containers adjacent to the classroom, a greenhouse or a three acre school farm. As such, all elements of the program are transportable. The primary curriculum guide is *The Growing Classroom*, which contains Science, Nutrition, and Gardening units and is accompanied by a scope and sequence. Prior to implementation, the program has a two-day workshop at the school site or at project site that prepares teachers for using the program, teaching techniques and the "living laboratory" approach. Following the initial training, staff development and program implementation become the responsibility of Lead Teachers in each school. Advance training is available and technical assistance will continue to be provided throughout the installation year. Adopters of the *Life Lab Science Program* typically generate a great deal of community support and resources. Cultivating the community is an important requirement of a successful adoption.

The adopter is responsible for travel and per diem costs. Trainer fees are to be negotiated. Implementation costs vary by site and the extent of "living laboratory" development. *The Growing Classroom* curriculum must be purchased for each implementing classroom teacher.

Services Awareness materials are avilable at no cost. Visitors are welcome by appointment to visit project sites in their home state or out-of-state. Project staff is available to attend out-of-state awareness meetings (costs to be negotiated). Training is conducted either at project site or adopter site (costs to be negotiated). Follow-up technical assistance is also available.

Contact **Gary Appel/Lisa Glick; Life Lab Science Program;1156 High St.,Santa Cruz, CA 95064; (408) 459-2001.**

Developmental Funding: ESEA, Title IV-C; Packard Foundation;
California State Department of Education; National Science Foundation

JDRP No. 86-17 (9/10/86)

Marine Science Project: FOR SEA (Grades 7-12).

FOR SEA: Investigating Marine Science (Grades 1-6).

Comprehensive, activity-oriented, marine science curriculum which teaches basic science skills and knowledge on or away from the coast.

Audience Approved by JDRP and PEP for all students, grades 1-12.

Description By the year 2000, three out of four Americans will live within an hour's drive of the sea or Great Lakes coasts. The impact on these coastal waters will be severe. The nationally validated curriculum materials of FOR SEA are designed to equip students with information necessary to make responsible decisions about the marine environment.

FOR SEA provides comprehensive, activity-oriented, marine education curriculum to be used in addition to or in lieu of an existing science program. Close proximity to seawater is not necessary to implement this curriculum in the classroom. Curriculum guides are available for the following grade levels: 1-2, 3-4, 5-6, 7-8, and 9-12 (Part I - Physical Oceanography, Part II - Marine Biology and Issues). Each guide contains a teacher background for each activity, student activity and text pages, answer keys for student activities, and a listing of vocabulary words for each unit.

FOR SEA is documented effective in teaching basic science skills and knowledge as measured by the CTB McGraw-Hill CTBS Science tests. The magic draw of water provides incentive to teach and learn science.

Requirements *FOR SEA* is designed to be implemented in classrooms at a room, grade, school, or district-wide level. Eight hours of in-service training provide implementing classroom teachers with an overview of the project, implementation procedures, and activities designed to familiarize them with the materials. A copy of the appropriate grade level curriculum guide must be purchased for each implementing classroom teacher at $35.00 per guide. Student text materials in the guide are designed to be reproduced by the adopting sites. Hands-on materials are generally found in the school setting or are readily available at local grocery or variety stores. The start-up costs vary by site.

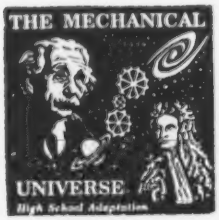
Services Awareness brochures and samplers of curriculum are available. Project staff is available to attend out-of-state awareness sessions, with negotiable cost-sharing. In-service training is provided to adopter site, again with cost-sharing negotiable. Follow-up services are provided by the project in appropriate cost-effective ways, including telephone, mail, cassette tape, and visits.

Contact **Laurie Dumdie, Demonstrator/Trainer; Marine Science Center; 17771 Fjord Drive N.E.; Poulsbo, WA 98370. (206) 779-5549.**

Developmental Funding: USOE ESEA Title IV-C

Grades 1-6 JDRP No. 81-37 ;88-4 (3/2/88)
Grades 7-12 JDRP No. 83-26 (3/28/83) PEP No. 87-5 (4/9/87)

Mechanical Universe *High School Adaptation*. A fresh and intriguing approach to a conceptual understanding of physics using modern audiovisual media materials.



Audience Approved by PEP for all high school physics teachers and students.

Description The ***Mechanical Universe*** *High School Adaptation* presents an innovative approach to motivating students toward mastering a conceptual understanding of physics. After the appropriate introduction by the teacher, a 15- to 20-minute videotape can take the student from a view of Newton working at his desk to close-ups of complicated experiments or modern nuclear laboratories, from animated cartoons of gravitational effects to three dimensional computer graphics that come alive, making the abstract concepts of physics more understandable. These visual images, in a historical concept, prompt the student's memory, imagination, and understanding as the narrative develops the typical (and not so typical) concepts of high school physics. The audiovisual materials in conjunction with the written teacher's and student's guides, encourage repeated viewings for an ever deepening comprehension of the topics presented.

The comprehensive written teacher's guide includes a specific plan outlining the necessary instructional procedures for the effective implementation of each module, supportive background information to assist teachers in their own understanding of the physical concepts, questions to explore common applications of the concepts, and test questions for the assessment of student understanding.

These materials can replace traditional material being used, for most physics topics typically presented in high school. The 24 topics available cover all but a very few topics contained in a traditional physics course, with some that are new to the typical course, such as *Navigating in Space.*

Furthermore, comparative studies between traditional materials and ***The Mechanical Universe*** *High School Adaptation* have revealed that ***The Mechanical Universe*** *High School Adaptation* students who express a greater interest in taking physics, as well as an improved confidence that they can succeed in physics. Students using the ***The Mechanical Universe*** *High School Adaptation* produced results with a mean score 11 percentile points higher than students using traditional materials.

Requirements A four-day workshop is required for implementation by teachers with a college major or minor in physics and five or more years teaching experience. Those teachers with less experience and/or college physics should take part in a 15-day workshop.

Services Written awareness materials can be obtained at no cost. The project demonstration site is open to visitors by appointment. Awareness and training workshops are available with costs to be negotiated.

Costs Purchase cost for the 24 modules is $450, which includes all videotapes, teacher's and students' guides, and duplication rights for the school. If the adopting site does not have a videocassette player and monitor, those must be acquired at current retail price.

Contact **Richard P. Olenick, Department of Physics, University of Dallas, 1845 East Northgate Drive, Irving, TX 75062-4799. (214) 721-5313.**

Developmental Funding: National Science Foundation

PEP No. 88-18 (11/1/88)

PRISMS: Physics Resources and Instructional Strategies for Motivating Students. A physics program that relates physics to the lives of high school students and stimulates students to develop reasoning/science problem-solving skills.

Audience Approved by PEP for students in grades 10-12 with backgrounds in beginning algebra, especially for those students who need additional motivation to learn the concepts and practical applications of physics.

Description PRISMS blends exploratory activities, concept development and application activities into a learning cycle. The concepts addressed in the *PRISMS Teacher Resource Guide* are those typically included in most high school physics courses including kinematics, dynamics, work and energy, internal energy and heat, wave phenomena, electricity and magnetism, and atomic and nuclear physics. High interest activities involving cars, bicycles, balloon rockets, dart guns, sailboats, etc., are utilized to teach the major concepts in physics. Exploration activities encourage students to observe relationships, identify variables, and develop tentative explanations of phenomena. Concepts are introduced through the experiences in this exploration phase. The student tests the generalization through observations in the application stage.

For each of 125 activities there are student sheets and teacher notes including teaching strategies, sample observations and calculations, a summary of the concept or outcome of the activity, and time required to conduct the activity. In most cases, there are multiple activities to support the learning cycle. The activities in the guide are an appropriate replacement of traditional laboratory experiments rather than supplementary materials. Student evaluation aids include a check list of indicators of student involvement in the laborator activities and a computer test bank of over 2000 questions keyed to course objectives and ranked by levels of reaoning according to Bloom's Taxonomy of educational objectives.

During one academic year of physics instruction, 10th - 12th grade students showed a significantly greater gain in physics achievement relative to a comparable control group which used conventional materials and teaching strategies. Gain was measured using two forms of the New York Regents Physics Examination on a pre-post test basis. In addition, PRISMS students also had higher gains in reasoning/science problem-solving skills compared to a control group which used conventional materials and strategies. Change was measured by using two forms of the Test of Integrated Process Skills (TIPS II) on a pre-post test basis.

Requirements To implement the program, the normal science laboratory facilities should be available. Several optional activities are provided that use computers for data acquisition. The physics teacher should understand the teaching strategies and be familiar with many of the activities before implementing the program. Inservice training for one to three weeks is highly desirable. PRISMS materials include the Teacher Resource Guide, two video tapes, and a test bank of questions for evaluating student learning at a cost of $150. Assuming 30 teachers attending a one-week training period, the cost for the training is approximately $130 per teacher. University credit is optional.

Services Awareness materials are available at no cost. Training is conducted during the summer at the development site at the University of Northern Iowa. In addition, staff are available to conduct workshops at other locations with costs to be negotiated. The principal classroom demonstration site may be visited by contacting Dr. Timothy Cooney listed below. For demonstration sites available for visitation near you, contact the PRISMS Project Office.

Contact **Roy D. Unruh, PRISMS, Project Office, Physics Department, University of Northern Iowa, Cedar Falls, IA 50614; (319) 273-2380 or Tim Cooney, PRISMS Demonstration Site, Price Laboratory School, University of Northern Iowa, Cedar Falls, IA 50613. (319) 253-2414.**

Developmental Funding: Iowa Department of Education
U.S. Department of Education - Secretary's Discretionary Fund

JDRP No. 87-4 (5/28/87)

Physics—Teach To Learn. An Educational Program That Works. A physics instructional program using teacher-controlled computer simulations and supporting curriculum materials.

Audience Approved by JDRP for 12th grade physics students.

Description The *Physics—Teach To Learn* program provides both teachers and students with instructional materials and processes that facilitate the exploration and illustration of selected physical events that have been found to be most frequently misunderstood by students, and most difficult for the teacher to illustrate in the classroom, and then tests the students' understanding and ability to make application of the physics concepts underlying those events.

The program's nineteen instructional modules with teacher-controlled computer simulations and supporting curriculum materials, developed by a committee of Los Angeles Unified School District master physics teachers with university support, were designed to provide students with fundamental qualitative understanding of physical events in selected topic areas. The computer simulations require the learner to make a judgment about a physical event. This judgment, based upon learner experience, and/or observation, often reveals misconceptions based upon defective logic. After the initial judgment (pre-test), the teacher then utilizes the computer simulation(s) to lead the student through the steps of exploration, development, and application. By using this step-by-step method, the teacher is best able to guide the correction of student misconceptions about the physical events under consideration. After this process has been completed, the student takes a formal paper/pencil post-test. Each topic is accompanied by extensive written curriculum material designed to enhance the teacher's ability to present the key concepts.

Requirements The *Physics—Teach To Learn* project developed materials were designed to be adaptable to any course approach and compatible with any text format. The project's curriculum package is comprised of 19 content modules, each with its own set of computer simulations, pre- and post-tests, and supplementary curriculum materials designed for teacher use. The first 15 of the project's content modules comprised the package that was presented to the U.S. Dept. of Ed.'s Joint Dissemination Review Panel for validation. Subsequent to project validation, an additional four curriculum content modules, developed following the same rigorous standards, processes, and formats as used in the preparation of the original 15 project modules, have been completed and added to the project's Curriculum Package. These materials have been packaged to facilitate dissemination and implementation at other sites. The program's 5.25 inch computer disks are designed for use only with the Apple IIc, IIe, or IIGS computers, a graphics printer, and a monitor. For classroom utilization, a 19-inch or larger television is recommended for display. No prior computer experience is necessary to effectively use the project's computer software or curriculum materials. Experienced physics teachers can be trained in the philosophy, content, and use of the modules in one day. New and/or "crossover" teachers will need two days of training. Need for training will be based upon teacher subject content awareness.

Costs The *Physics—Teach To Learn* program's curriculum materials—including the computer disks—are available for a cost of $300 per set. The project does not charge a training fee. School districts may also have to cover the costs of releasing their teachers to attend the inservice training workshops. If the adopting site does not have the equipment required to implement the program, the cost to acquire the necessary equipment will be approximately $1,550. Once the curriculum materials have been purchased and initial training has occurred, the program can be operated with no additional cost factors.

Services Awareness materials are available at no cost. Visitors are welcome by appointment at the project's demonstration sites. Project staff is available to conduct out-of-state awareness meetings. Training can be conducted either at the project site or at sites selected by potential adopters or by NDN State Facilitators.

Contacts **Leni Posner, Specialist, Grants Assistance Unit, Los Angeles Unified School District, 450 North Grand Avenue, Room G-286, Los Angeles, CA 90012, (213) 625-6596. Charles Schleiden, Project Disseminator, Bell High School, 4328 Bell Avenue, Bell, CA 90201, (213) 773-2408.**

Developmental Funding: ECIA Chapter 2

JDRP No. 86-16 (9/25/86)

Sci-Math. A supplement to the science or mathematics curriculum, usable in grades 7 through 12, that teaches problem--solving skills by using labelled rates for factor analysis, stretching and shrinking, and percent.

Audience Approved by JDRP for average to above- average students in grades 7-10, low achievers including educationally disadvantaged students taught at a slower pace in grades 7-12.

Description Sci-Math uses the mathematics of rates and ratios to simplify and unify problem-solving in science, mathematics, and everyday life. The material is available in two modules. The first contains no algebraic variables and is appropriate for all students from 7th grade math through physics. The second should be studied after the first and should be used with students who are confident in their use of algebraic variables. The program was developed by Dr. Madeline P. Goodstein at Central Connecticut State University with the support of the National Science Foundation.

Central Theme: The technique known as factor analysis, dimensional analysis, or labelled rates is presented in careful steps, showing all possible pitfalls in using the method, and showing how to avoid--or correct--them. The technique should be viewed by mathematics teachers as a necessary step-up in sophistication, since many problems involving rates can be solved in one large step, rather than in a series of small problems whose answers eventually may cancel each other. The method is particularly valuable with calculators. It also is valuable in demonstrating the difference between calculation and problem-solving.

Applications: The goal is to have students use labelled rates so that they become a life skill. Mathematics in everyday living involves and applies these same rate concepts in consumer purchasing, business, crafts, and industry. The Sci-Math approach to proportions enables even Piagetian pre-formal students to understand proportions and apply them to problem-solving.

Activities: There are 23 hands-on activities in the course. They all deal with situations familiar to students and relate to home, play, school, and business. Materials used are readily available and inexpensive: rulers, string, pennies, spoons, jars, masking tape.

Teacher Support: A Teacher's manual is available for each of the two modules, wth all problems worked out in detail. The manuals also provide record sheets, data, and answers to questions for the activities.

Time Requirement: Sci-Math can be used in many different formats, as a separate unit or as a parallel course. For advanced algebra, chemistry, or physics, a small group or individuals may study the modules in less than two weeks. For less advanced or younger classes, teachers may spend a quarter of the year or only a few weeks, depending on the depth of learning they hope to achieve. It is important that all teachers realize Sci-Math does not add material to their courses; instead, Sci-Math shows students new and efficient ways to solve problems that are already part of the course.

Requirements Sci-Math can be used in any classroom. Student modules and teacher guides are available at approximately $7 per copy from a commercial publisher. Materials are non-consumable and can be reused several times, making them cost-effective. Material costs for experiments and activities are minimal.

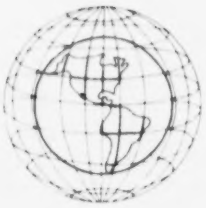
Services Awareness materials are available at no cost. Project personnel is available for one-hour awareness presentations, or training workshops of 4 to 6 hours. Costs for these services, as well as evaluation and follow-up, are negotiated with the sponsoring organization.

Contact **James P. McAuliffe, Sci-Math Director; Education & Technology Foundation; 4655 25th Street; San Francisco, CA 94114. (415) 824-5911.**

Developmental Funding: National Science Foundation

JDRP No. 82-20 (5/12/82)
Recertified (6/86)

Science-Technology-Society: Preparing For Tomorrow's World. A multi-disciplinary approach to problem solving and critical thinking designed to promote decision-making and problem-solving skills needed to deal with issues at the interface of science, technology, and society.



Audience Approved by JDRP for all students, grades 7-12.

Description In our increasingly complex technological world, issues and problems also become increasingly complex. Students need more sophisticated problem-solving and decision-making skills to deal effectively with current and future societal issues. The goals of the PTW molecules are the development of logical, higher level thinking and social reasoning skills in the context of science, technology, and society. Serving as the guiding framework for the materials, activities, and teaching strategies, a sound instructional model is utilized to develop the skills necessary for students to move to higher levels of cognitive reasoning and citizenship.

Preparing for Tomorrow's World is comprised of a set of 12 independent curriculum modules. Topics covered include:

- Energy Use and Conservation
- Coastal Issues
- Technological Change
- Transportation
- Communications
- Medical Technology
- Urban Land Development
- Cultural Impact
- Space Travel

Modules are designed to provide appropriate material for students at grades 7-8, 9-10, and 11-12. Modules average $60 per unit. Since the materials can be reused over a period of several years, per pupil costs are reduced appreciatively. The modules have been successfully field-tested on over 6,000 students to complement courses such as English, science, reading, social studies, and biology. Student handouts, booklets and filmstrips are utilized in activities such as scenario writing, graphing, problem-solving, conducting surveys, and futures forecasting, to add another dimension to existing curricula. Discussion and debate among students encourages critical self-evaluation and promotes more complex reasoning ability and increased perspective-taking abilities. Depending on the modules selected and the course structure in which they are used, activities may be used in continuous sequence, interspersed throughout existing courses, or, as in the senior high grades, taught as discrete units of study.

Requirements No special staffing or facilities are required to implement ***Preparing for Tomorrow's World*** in any school district. This program is intended to supplement existing courses of study and to be utilized by the regular classroom. Because unique teaching strategies are employed, a two-day teacher training workshop is highly recommended for all teachers desiring to implement the program.

Services Awareness materials are available at no cost. Arrangements can be made, if given advance notice, for visitors to observe the program in use in various settings. Project personnel is available to attend out-of-state awareness meetings. Training is conducted at the project site or at the adopter site. Implementation, follow-up, and evaluation services are available to adopters. Costs for all services available to be negotiated.

Contact **Sopris West, Inc., 1140 Boston Ave., Longmont, CO 80501. (303) 651-2829.**

Developmental Funding: USOE ESEA Title IV-C

JDRP No. 81-10 (12/15/81)

Starwalk. A comprehensive earth/space science program for elementary students.

Audience Approved by JDRP for grades 3 & 5. The program has also been used in grades 4 and 6.

Description *Project Starwalk* provides instruction in Earth/Space science concepts to students in grades 3 to 5. The students receive a series of classroom lessons structured around three seasonal visits to a planetarium facility. Classroom lessons are designed as both pre and post-planetarium visit in order to prepare students for their activities at the planetarium, and to consolidate and further the learning after the visit. Planetarium and classroom teaching guides provide the instructional materials for the lessons.

Students in both levels are introduced to the seasonal stars and constellations during each planetarium visit. Students in level 3 study the concept of time as it relates to earth rotation and revolution. Students in level 5 study earth rotation, revolation and its axial tilt as factors in controlling seasons on earth. Classroom teachers participate in the planetarium lessons right along with their students.

Requirements The availability of a planetarium facility, either fixed-base, or portable is an essential component of this program. Classroom materials required are minimal, but should include a celestial sphere, and earth/sun model. Recommended classroom instructional time for each seasonal unit is about 6 hours, including planetarium lab visit. Inservice training requires two days, one for each grade level, and is conducted at the planetarium facility.

Services Awareness materials are available at no cost. Developer is available to attend out-of-state awareness meetings (costs to be negotiated). Visitors are welcome at project site during school year by appointment. Training can be conducted at adopter or project site. Training at project site, adopter pays own expenses and workshop fees. Training at adopter site, adopter pays developer's expenses for honorarium, transportation, lodging, and per diem. Training is not limited to school year but is available throughout the year. Implementation/follow-up services are also available. Cost of instructional, materials (Teacher guidebook, duplicating masters, and resource guide) $35.00 per package. One required for each grade level. Instructional materials from packet may be duplicated for participating teachers and students at adoption site. Per-pupil cost per year is dependent upon costs for student transportation, plaetarium utilization fees, supplies, and indirect costs.

Contact **Bob Riddle; Project STARWALK; Lakeview Museum Planetarium; 1125 W. Lake Avenue, Peoria, IL 61614. (309) 686-NOVA.**

Developmental Funding: Title IV-C, State and Local

JDRP No. 83-9 (3/4/83)

Stones and Bones. A Laboratory Approach to the Study of Biology, Modern Science, and Anthropology. An innovative program designed to enrich and meet the present modern or life science, biology, and physical anthropology courses.

Audience Approved by JDRP for science students of all ability levels. The program has been successfully implemented in grades 7-12.

Description The program meets the needs of all ability students. The format is interdisciplinary in design and emphasizes active student participation through laboratory explorations. Modern (general) or life science and biology instructional units supplement, enrich, and extend current science curricula. Three instructional pathways emphasize the study of humankind:

Modern (General) Science Pathway: Designed to motivate non-college-oriented students. Each of the 20 laboratory explorations offers the general science student "hands-on" opportunities to investigate topics such as geologic time, measuring radioactivity, mapping, behavior of primates, and replica casts of fossil hominids. During this four- to six-weeks unit, students will also have an opportunity to simulate archeological excavation.

Biology Pathway: A four- to six-week overview of physical anthropology. The unit provides students with "hands-on," in-depth experiences as a supplement to physical anthropology in biology textbooks. A series of 11 investigative explorations focuses on topics including primate behavior and distribution, interpreting archeological records, primate locomotion and morphology, and replica casts of fossil hominids. This approach reinforces and extends many basic concepts taught in the study of biology.

Semester Course Pathway: This pathway in physical anthropology provides students the opportunity to study the story of humankind in depth. Laboratory investigations pursue such topics as phylogeny through time, continental drift, locomotion and behavior of primates, classification and morphology, as well as 14 fossil replica casts of Australopithecus, Homo Erectus, Neanderthal, and Cro-Magnon.

Instructional materials for all three pathways are highly self-directive, requiring minimal teacher training. In addition to printed materials, cast replicas of fossil casts and instructional materials used in the explorations have been validated to be scientifically accurate by the L.S.B. Leakey Foundation, Los Angeles County Museum of Natural History, and by world-recognized anthropologists from various major universities.

Based on the recommended basic materials needed for implementation, the start-up cost will be approximately $471 for modern (general) science unit, $895 for biology unit, and $1300 for semester course. An alternative is to implement the program with fossil cast photo reprints in actual size in lieu of the fossil replica cast; the cost will then be approximately $55 for each of the instructional pathways. Any number of classes can share the materials if classes are scheduled at different periods or days. There is no additional cost in subsequent years of operation.

Requirements *Stones and Bones* can be implemented in various ways. The selection of the pathway is determined by school and student needs. All three pathways require no special facilities or equipment. Existing classrooms and readily available items from any classroom such as rulers, scissors, and paste will be adequate. Teachers with none to minimal anthropology background will need no more than one day of training for initiating each of the three pathways successfully. Teachers' Guides for the three pathways are available to effectively implement the program.

Services Awareness materials are available at no cost. Visitors are welcome at project's demonstration school site by appointment. Training workshops are conducted at project sites and/or adopter sites with costs to be shared. Project staff is available to attend awareness meetings out of state with costs to be negotiated.

Contact **Sid Sitkoff, Director; Los Angeles Unified School District; Office of Instruction; 450 N. Grand Ave.; Los Angeles, CA 90012. (213) 625-6419. Milton Anisman, Disseminator; Physical Anthropology Center; 6625 Balboa Blvd.; Van Nuys, CA 91406. (818) 997-2389.**

Developmental Funding: USOE ESEA Title IV-C

JDRP No. 82-29 (5/26/82)

WIZE: Wildlife Inquiry through Zoo Education, Module II Survival Strategies. A life sciences program which improves understanding of concepts related to population, ecology, wildlife conservation, and species for students in grades 7-9.

Audience Approved by PEP for all students, grades 7-9.

Description Combining classroom study with the unique scientific resources available at zoos, Survival Strategies explores issues related to wildlife survival in the 21st Century.

Using a non-traditional, multi-disciplinary approach, the program improves understanding of concepts related to population, ecology, wildlife conservation, and species survival. In small study groups and in highly motivating hands-on activities that encourage decision-making, Survival Strategies develops an understanding that animals are members of populations that interact with one another and that ecological processes affecting animals also affect humans. Involving an average of 15 weeks of instruction (for classes with at least four science periods a week; 20 weeks for those with fewer science periods per week), the program includes three zoo visits (or one combined visit if access to a zoo is difficult.) Using motivational activites, materials such as photo cards and worksheets, discussions, zoo visits, considerable homework, and Posterity, a roll playing activity, students are exposed to the scientific method and develop problem-solving skills, working towards solutions which cause the least disruption to the environment.

Along with Module I of WIZE (Diversity of Lifestyles, which explores habitats and survival techniques), Survival Strategies educates young people to approach difficult problems analytically and make decisions based on informed perspectives rooted in a firm understanding of complex scientific concepts. The two modules form a continuum in the study of wildlife ecology; however, each can serve on its own merits as an independent curriculum or as a supplement to an existing life sciences program.

After participating in Project WIZE for a period of 12 to 15 weeks, students in grades 7-9 significantly improved their understanding of life science concepts as measured by WIZE Module II test—Surivival Strategies. This claim is based on an experimental and comparison group study involving 196 students as well as pre- post-test results from Schools in 13 states involving 15,000 students.

Requirements No special facilities are required within an adopting school. Access to a zoo, or alternate natural history insitution, is recommended buy the program has been used by some teachers without such access. Although the detailed Teachers' Manual enables instructors to conduct the program successfully without special training, such training is useful and is encouraged for optimal implementation. Curriculum/learning materials include the following:

6 sets of 24 Discovery Cards

34 Student Resource Books: Survival Strategies

22 Phot Cards

41 student worksheets to accompany lessons

136-page Teachers' Manual for 23 lessons

2 cassettes and a 96-frame filmstrip

Posterity, a wildlife management game

Services Implementation of the WIZE Survival Strategies program requires the purchase of one kit at a cost of $325. Visitors are welcome by appointment to the project site for an awareness demonstration. Project staff is available to attend out-of-state awareness meetings. One-Three day training options are available in requesting district and states throughout the year. Follow-up assistance is also available to adopters.

Contact **Annette Berkovits, Curator of Education and Director of Project WIZE, Bronx Zoo, New York Zoological Society, 185th Street and Southern Boulevard, Bronx, NY 10460; (212) 220-5135 or 220-6855 or Donald Lisowy, NDN Project Coordinator, (212)220-5131 or 220-5136.**

Developmental funding: National Science Foundation

JDRP No. 86-6 (4/9/87)

October 1990

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